

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- ✓ TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

What is claimed is:

1. A nozzle for providing nitrous oxide to an internal combustion engine, the nozzle comprising:
 - a fuel injector passage, having a central axis and terminating at an injector outlet, for passing fuel from a fuel injector therethrough; and
 - a first auxiliary passage, terminating at a first outlet, for passing nitrous oxide therethrough.
2. The nozzle of claim 1, wherein the nozzle is adapted to be positioned between a fuel injector and an engine without substantial modification to the engine.
3. The nozzle of claim 1, wherein the nozzle is adapted to be positioned proximal to the engine's original fuel injector location.
4. The nozzle of claim 1, wherein the fuel injector passage is tapered to have a larger inside diameter at the injector outlet.
5. The nozzle of claim 1, wherein the fuel injector passage has an inside diameter of between about 0.035 and about 0.200 inches.
6. The nozzle of claim 1, wherein the fuel injector passage has an inside diameter of about 0.075 inches to about 0.116 inches.
7. The nozzle of claim 1, wherein the nozzle is adapted to fit between a fuel injector and an engine without raising the fuel injector more than about 1.25 inches relative to a fuel injector receptacle.
8. The nozzle of claim 1, wherein the nozzle is adapted to fit between a fuel injector and an engine without raising the fuel injector more than about 0.75 inches relative to a fuel injector receptacle.
9. The nozzle of claim 1, wherein the nozzle is adapted to fit between a fuel injector and an engine without raising the fuel injector more than about 0.50 inches relative to a fuel injector receptacle.

10. The nozzle of claim 1, further comprising a second auxiliary passage, terminating at a second outlet, for passing nitrous oxide or additional fuel therethrough.
11. The nozzle of claim 10, wherein the first auxiliary passage has a diameter of about 0.025 inches to about 0.075 inches.
12. The nozzle of claim 10, wherein the first auxiliary passage has a diameter of about 0.050 inches.
13. The nozzle of claim 10, wherein the second auxiliary passage has a diameter of about 0.025 inches to about 0.075 inches.
14. The nozzle of claim 10, wherein the second auxiliary passage has a diameter of about 0.050 inches.
15. The nozzle of claim 10, further comprising a diffuser plate located proximal to the first outlet and the second outlet.
16. The nozzle of claim 15, wherein the diffuser plate is angled relative to the central axis.
17. The nozzle of claim 16, wherein the diffuser plate is angled by about 5 degrees to about 90 degrees relative to the central axis.
18. The nozzle of claim 16, wherein the diffuser plate is angled by about 10 degrees to about 30 degrees relative to the central axis.
19. The nozzle of claim 10, wherein the first outlet and the second outlet comprise radial outlets.
20. The nozzle of claim 19, wherein the first outlet and second outlet are rectangular passages.
21. The nozzle of claim 20, wherein the first outlet and second outlet have a width (in a plane orthogonal to the central axis of the fuel injector passage) of about 0.050 inches to about 0.150 inches, and a height (in a plane parallel with the central axis of the fuel injector passage) of about 0.010 inches to about 0.040 inches.

22. The nozzle of claim 20, wherein the first outlet and second outlet have a width (in a plane orthogonal to the central axis of the fuel injector passage) of about 0.100 inches and a height (in a plane parallel with the central axis of the fuel injector passage) of about 0.020 inches.
23. The nozzle of claim 19, wherein the first outlet and second outlet are each angled in a helical fashion relative to the central axis.
24. The nozzle of claim 23, wherein the first outlet and second outlet are each angled toward the central axis by about 5 degrees to about 90 degrees, and are angled in a plane orthogonal to the central axis by about 0 degrees to about 90 degrees relative to the outer surface of the nozzle at the respective outlet.
25. The nozzle of claim 23, wherein the first outlet and second outlet are each angled toward the central axis by about 45 degrees to about 60 degrees, and are angled in a plane orthogonal to the central axis by about 40 degrees to about 60 degrees relative to the outer surface of the nozzle at the respective outlet.
26. The nozzle of claim 10, wherein the first outlet and the second outlet are on opposite sides of the fuel injector outlet.
27. The nozzle of claim 10, wherein the first outlet and the second outlet are located about 10 degrees to about 180 degrees apart relative to the central axis of the fuel injector passage.
28. The nozzle of claim 10, wherein the first outlet and the second outlet are located about 45 degrees to about 135 degrees apart relative to the central axis of the fuel injector passage.
29. The nozzle of claim 10, wherein the first outlet and the second outlet are located about 90 degrees apart relative to the central axis of the fuel injector passage.
30. A nozzle for providing combustion reactants to an internal combustion engine, said nozzle comprising:

a fuel injector passage, having a central axis and terminating at an injector outlet, for passing fuel from a fuel injector therethrough; and

a plurality of first auxiliary passages, terminating at a plurality of first outlets, for passing a nitrous oxide supply therethrough, the first auxiliary passages being located in an annular pattern around the central axis and radially outward of the injector outlet.

31. The nozzle of claim 30, wherein the fuel injector passage has a diameter of about 0.250 inches to about 0.750 inches.
32. The nozzle of claim 30, wherein the fuel injector passage has a diameter of about 0.375 inches to about 0.625 inches.
33. The nozzle of claim 30, wherein the fuel injector passage has a diameter of about 0.450 inches to about 0.550 inches.
34. The nozzle of claim 30, wherein the plurality of first auxiliary passages each have a diameter of about 0.020 inches to about 0.100 inches.
35. The nozzle of claim 30, wherein the plurality of first auxiliary passages each have a diameter of about 0.040 inches to about 0.080 inches.
36. The nozzle of claim 30, wherein the plurality of first auxiliary passages each have a diameter of about 0.060 inches.
37. The nozzle of claim 30, wherein the plurality of first auxiliary passages comprises 2 to 16 first auxiliary passages.
38. The nozzle of claim 30, wherein the plurality of first auxiliary passages comprises 5 to 12 first auxiliary passages.
39. The nozzle of claim 30, wherein the plurality of first auxiliary passages comprises 7 to 9 first auxiliary passages.
40. The nozzle of claim 30, further comprising a plurality of second auxiliary passages, terminating at a plurality of second outlets, for passing a combustion reactant

therethrough, the second auxiliary passages being located in an annular pattern around the central axis and radially outward of the first auxiliary passages.

41. The nozzle of claim 40, wherein the plurality of second auxiliary passages each have a diameter of about 0.020 inches to about 0.100 inches.
42. The nozzle of claim 40, wherein the plurality of second auxiliary passages each have a diameter of about 0.040 inches to about 0.080 inches.
43. The nozzle of claim 40, wherein the plurality of second auxiliary passages each have a diameter of about 0.060 inches.
44. The nozzle of claim 40, wherein the plurality of second auxiliary passages comprises 2 to 16 second auxiliary passages.
45. The nozzle of claim 40, wherein the plurality of second auxiliary passages comprises 5 to 12 second auxiliary passages.
46. The nozzle of claim 40, wherein the plurality of second auxiliary passages comprises 7 to 9 second auxiliary passages.
47. A nozzle for providing combustion reactants to an internal combustion engine, said nozzle comprising:

an interior cup having an injector inlet end and an outlet end opposed to the injector inlet end, the interior cup comprising:

- a fuel injector receptacle in the injector inlet end;
- a fuel injector passage, the fuel injector passage having a central axis and terminating at the outlet end;
- a first auxiliary input location;
- a plurality of first auxiliary passages arranged in an annular pattern around the central axis and radially outward of the fuel injector passage and extending from the first auxiliary input location to the outlet end;

a first annular ring disposed around the interior cup proximal to the first auxiliary input location, the first annular ring comprising a first auxiliary input port; and

a receptacle cup disposed around the interior cup proximal to the outlet end;

wherein the fuel injector passage is adapted to pass fuel from a fuel injector to the outlet end, the first auxiliary input port is adapted to pass a first combustion reactant to the plurality of first auxiliary passages, and the plurality of first auxiliary passages are adapted to pass the first combustion reactant to the outlet end.

48. The nozzle of claim 47, wherein the receptacle cup is an existing fuel injector receptacle in an engine.
49. The nozzle of claim 47, wherein the receptacle cup is welded to an engine intake.
50. The nozzle of claim 47, wherein the receptacle cup is threaded into an engine intake.
51. The nozzle of claim 47, wherein the interior cup is threaded into the receptacle cup.
52. The nozzle of claim 47, wherein the interior cup is retained in the receptacle cup by one or more o-ring seals.
53. The nozzle of claim 47, wherein the plurality of first auxiliary passages comprises 2 to 16 first auxiliary passages.
54. The nozzle of claim 47, wherein the plurality of first auxiliary passages comprises 5 to 12 first auxiliary passages.
55. The nozzle of claim 47, wherein the plurality of first auxiliary passages comprises 7 to 9 first auxiliary passages.
56. The nozzle of claim 47, wherein the first auxiliary input location comprises an annular groove.
57. The nozzle of claim 47, wherein the first annular ring further comprises an inner annular groove.

58. The nozzle of claim 47, wherein the first combustion reactant is gasoline, diesel fuel, natural gas, propane, nitromethane, alcohol or an alcohol blend.

59. The nozzle of claim 47, wherein the interior cup further comprises:

a second auxiliary input location;

a plurality of second auxiliary passages arranged in an annular pattern around the central axis and radially outward of the plurality of first auxiliary passages and extending from the second auxiliary input location to the outlet end; and

a second annular ring disposed around the interior cup proximal to the second auxiliary input location, the second annular ring comprising a second auxiliary input port;

wherein the second auxiliary input port is adapted to pass a second combustion reactant to the plurality of second auxiliary passages, and the plurality of second auxiliary passages are adapted to pass the second combustion reactant to the outlet end.

60. The nozzle of claim 59, wherein the plurality of second auxiliary passages comprises 2 to 16 second auxiliary passages.

61. The nozzle of claim 59, wherein the plurality of second auxiliary passages comprises 5 to 12 second auxiliary passages.

62. The nozzle of claim 59, wherein the plurality of second auxiliary passages comprises 7 to 9 second auxiliary passages.

63. The nozzle of claim 59, wherein the second combustion reactant is gasoline, diesel fuel, natural gas, propane, nitromethane, alcohol or an alcohol blend.

64. The nozzle of claim 59, wherein the second annular ring further comprises an inner annular groove.